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Introduction

The National Marine Sanctuary Program (NMSP) education team has embarked on an ambitious evaluation project that will allow the NMSP to assess education program outcomes and impacts across all sites and activities and to link outcome measures to program efforts. The purpose of this effort is to evaluate if current and future education efforts are meeting the goals and objectives of the education and outreach programs and the educational mandates of the National Marine Sanctuary Act. The application of these findings will assist in adjusting program content, format, activities mix and target audiences to improve overall effectiveness of educational efforts and expenditures.

Evaluation is an integral part of quality education—it's not just the test at the end. Evaluation is the systematic study and documentation of a program's outcomes to improve its effectiveness, guide judgments about its impact, and/or inform decisions about its future. Evaluation can help you learn more about your audience's understandings, needs and issues as you plan your project. It can help you adjust and improve as you develop your program. And finally, evaluation can help you assess how well you've done after implementing your program. Evaluation throughout keeps you connected to your audience and on track with your goals and objectives.

Purpose and Need for a NMSP Education Evaluation Program

Purpose

The purpose of this document is to provide guidance to NMSP Education Team members on the official process and structure of evaluating educational programming within sanctuaries. The document will provide:

- Background on the core purpose of the Education and Outreach Program;
- The need and intended purpose of the Education Evaluation System;
- A framework for evaluation planning to guide systematic and consistent evaluation processes throughout sanctuaries;
- Program tracking and evaluation assessment reporting procedures;
- Resources to assist in developing an evaluation.

This toolbox is to be considered a "living" document that will be refined and updated by NMSP Staff to ensure that the latest thinking and best practices of effectiveness evaluation are incorporated. To promote consistency in application of education evaluation throughout the NMSP education team members will be provided with periodic updates and trainings on these refinements.

Need

The primary need for this document is internal. Education Team members need a guiding document which delineates the expectations and guiding mandates for a national evaluation system. This toolbox seeks to improve efficiency and consistency of education evaluation

processes throughout the sanctuary system. Having a common system allows the program to better assess the impacts of educational efforts and the overall success of the program.

This document also has external application. The systematic processes outlined in this document provide evidence of rigor and planning for the effectiveness evaluation measures in the NMSP OMB Education Crosscut Performance Measure and other external processes. The program inventory system and update process outlined in this document also allow for external reporting often requested by external funding and education administrative units.

NMSP Education Program Philosophical Framework

Having a clear understanding of the philosophical context of a program is a key step in assessing the effectiveness of a program in advancing the goals of the organization. The following section outlines the mandates, directives, goals and key concepts which form the environment in which NMSP education programs are developed and the standards to which they are evaluated.

National Marine Sanctuary Act

The enabling legislation for the National Marine Sanctuary system, the National Marine Sanctuary Act, denotes specific educational mandates. The legislation states that one of the purposes of the NMSP is:

"to enhance public awareness, understanding, appreciation and wise and sustainable use of the marine environment, and the natural, historical, cultural and archeological resources of the National Marine Sanctuary System. Efforts supported, promoted, or coordinated under this subsection must emphasize the conservation goals and sustainable public uses of national marine sanctuaries and the System." Section 309 (c) (1) of the NMSA

This guiding mandate forms the basis for the existence of the Education and Outreach Program and helps to focus the educational themes of its offerings.

NOAA Strategic Plan

The National Oceanic and Atmospheric Administration (NOAA) is the parent organization for the NMSP and provides additional guidance on educational efforts within sanctuaries. In the annual update of NOAA's Strategic Plan, the NOAA Annual Guidance Memorandum for FY 2008 – 2012, environmental literacy goals are also specified:

> "Environmental literacy is integral to NOAA's mission: All of NOAA's long-term goals ultimately depend on the public's capacity to understand and react to Earth system science and ecosystem conditions. A better informed public will provide improved environmental stewardship and will acquire, use, and respond to NOAA's information services and forecasts in more predictable and effective ways…individuals who understand the complex interdependencies within an

> ecosystem - including their own roles - are more likely to act as stewards of that ecosystem. Given the central role of environmental literacy to NOAA's long-term effectiveness, NOAA places a high priority on formal and informal education efforts leveraging NOAA's distinctive scientific, technical, and operational expertise."

This approach to environmental literacy is directly applied to ocean literacy in the NMSP. In addition the directive to focus on formal and informal education is reflected in the framework of the NMSP educational offerings.

NMSP 2005-2015 Strategic Plan

In 2005 the Planning Committee of the NMSP developed a 10 year strategic plan of operations for the organization. Specific educational goals and strategies were established to guide the progress of the Education and Outreach program.

Education and Outreach Goal:

> "to enhance nation-wide public awareness, understanding and appreciation of marine and Great Lakes ecosystems and maritime heritage resources through outreach, education and interpretation efforts"

The specific performance measure for evaluating this goal is:

> "By 2010 all education programs implemented in national marine sanctuaries will be assessed for effectiveness against stated program goals and objectives and appropriate National and State education standards."

This goal and performance measure direct development of the offerings and accountability for education and outreach programs and is the impetus for development of this education evaluation system.

NMSP 2007-2013 Education Strategic Plan (in draft)

In 2005-2006 the Education Executive Council and Education Cross-Cut Team developed a 7 year strategic plan. Specific NMSP Education cross-cut vision, mission, goals, and objectives were established to guide the progress of the Education and Outreach program.

Vision:

> "An ocean literate public making informed environmental decisions."

Mission:

> "To inspire ocean literacy and conservation through national marine sanctuaries."

Sanctuary Management Plans

At the sanctuary level specific educational program offerings are further directed by the Management Plan for that site. These 5-year plans provide guidance on the themes and management issues of highest priority to the site and reflect the unique resources, legislative mandates, regional community and threats to sustainability of the sanctuary. In addition, the Sanctuary Management Plan may call for the establishment of a Sanctuary Advisory Committee which has specific focus on education and outreach. These committees will serve to advise the Sanctuary Education and Outreach Staff of current needs and opportunities for educational programs.

NMSP Education and Outreach Program

In support of the previously stated mandates, directives and goals the NMSP Education Team has established the following goals:

- To increase ocean literacy.
- To empower ocean stewardship and conservation.
- To increase awareness of the National Marine Sanctuary Program.

These goals are to be affected through a broad range of educational and outreach programming at the national level through NMSP headquarter staff managed initiatives and at each sanctuary through the programmatic efforts of the education and outreach staff. These goals provide a basic framework to guide the focus of such programs.

The specific concepts of ocean literacy, ocean conservation and stewardship have been developed in partnership with other national initiatives in the broader educational community.

Ocean Literacy Concepts

In 1999, The Ocean Project conducted a national survey to establish a baseline for ocean literacy in the American public. This study indicated that in 1999 the American public had only a superficial awareness of the importance of the ocean to their daily lives and even less awareness of its importance to all life on the planet (Belden et al, 1999). These findings in combination with other educational initiatives to improve science, technology, engineering and mathematics (STEM) education advanced national efforts to focus on further defining ocean literacy and integrating the concept into national science education standards. The resulting work resulted in the establishment of a definition, seven essential principles and over 40 fundamental concepts. The definition and essential principles are presented here:

Ocean literacy is an understanding of the oceans influence on you and your influence on the ocean.

An ocean-literate person:

- understands the essential principles and fundamental concepts;
- can communicate about the oceans in a meaningful way;
- is able to make informed and responsible decisions regarding the oceans and its resources.

Essential Principles of Ocean Literacy:

1. The Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of the Earth.
3. The ocean is a major influence on weather and climate.
4. The ocean makes the Earth habitable.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.
7. The ocean is largely unexplored.

In further reviewing the fundamental concepts of each principle the NMSP Education Team determined that the concepts for Principle 6 best reflected the context of the other philosophical frameworks in which the program operates. These concepts provide the basis for ocean literacy content in NMSP educational offerings:

Principle 6: The ocean and humans are inextricably interconnected.

a) The ocean affects every human life. It supplies freshwater (most rain comes from the ocean) and nearly all Earth's oxygen. It moderates the Earth's climate, influences our weather, and affects human health.

b) From the ocean we get foods, medicines, and mineral and energy resources. In addition, it provides jobs, supports our nation's economy, serves as a highway for transportation of goods and people, and plays a role in national security.

c) The ocean is a source of inspiration, recreation, rejuvenation and discovery. It is also an important element in the heritage of many cultures.

d) Much of the world's population lives in coastal areas.

e) Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (point source, non-point source, and noise pollution) and physical modifications (changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

f) Coastal regions are susceptible to natural hazards (tsunamis, hurricanes, cyclones, sea level change, and storm surges).

g) Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

Ocean Stewardship and Conservation

The NMSP Education Team accepts the following definitions for stewardship and conservation:

Stewardship: the conducting, supervising, or managing of something; especially: the careful and responsible management of something entrusted to one's care (stewardship of our natural resources).

Conservation: a careful preservation and protection of something; especially: planned management of a natural resource to prevent exploitation, destruction, or neglect

These serve as guiding principles in the development of programs which seek to empower the public to act as stewards of the oceans. The NMSP is mandated to serve as stewards and to conserve the marine sanctuaries, these education programs reach out to the general public and to strategic partners to further empower them in this mission. Only through these partnerships can the NMSP move beyond the policy and into long term sustainability of the ocean environment.

NMSP Awareness

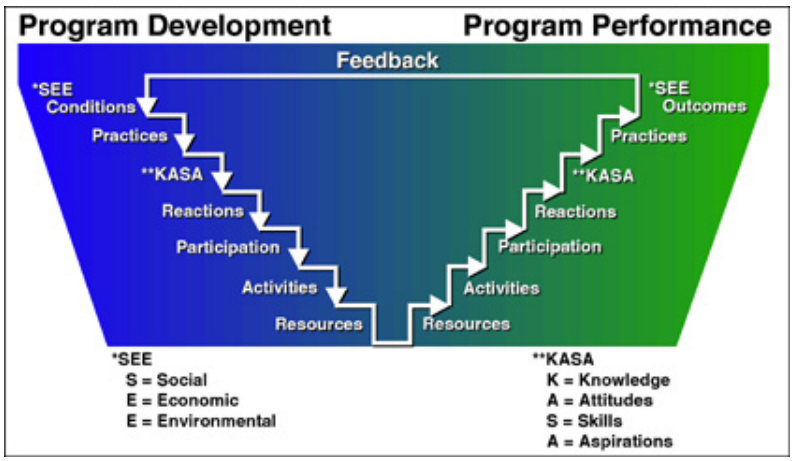
The National Marine Sanctuary Education Program strives to make the public aware of the following Sanctuary associated items:

- The collective role and importance of the National Marine Sanctuary Program in marine and Great Lake Conservation and sustainability.
- The role of specific sanctuaries to the national system and local region ecologically and economically.
- The role and relationship of marine sanctuaries to broader marine environments and environmental and economic sustainability.
- The regulations and policies which limit access or interaction with sanctuary resources.
- The natural and maritime heritage resources within the sanctuary.
- The threats to the sanctuary and sources of these threats.
- Opportunities to support and protect sanctuary resources.
- Opportunities to learn more about sanctuaries.
- Acceptable behaviors and practices of sanctuary visitors (suggested, non-regulatory).

NMSP Evaluation and Planning Framework

Targeting Outcomes of Programs (TOP)

The framework for the evaluation system borrows from the "Targeting Outcomes of Programs" (TOP) model developed by Claude Bennet and Kay Rockwell in 1994 for the USDA Extension Service (Bennet and Rockwell, 2006). The TOP model incorporates seven levels of evaluation:



Level 1: Social, Economic, and Environmental Conditions (SEE)

SEE represents Social, Economic, and, Environmental conditions (or situations) that may need improvement. Social, Economic, and Environmental outcomes are the end results or benefits from programs targeted toward SEE conditions. These outcomes may represent public or private benefits. Social, Economic, and Environmental needs decrease as they are prevented, checked, reduced, or solved by the use of recommended practices (or behaviors).

Level 2: Behavioral Practices

Practices are patterns of behaviors, procedures, or actions that influence SEE condition. Through educational programs, individuals, groups, organizations, and communities adopt practices and technologies that achieve needed SEE outcomes. These practices are adopted as program participants apply relevant knowledge, attitudes, skills, and aspirations.

Level 3: Knowledge, Attitudes, Skills, and Aspirations (KASA)

KASA refers to Knowledge, Attitudes, Skills, and Aspirations that influence the adoption of selected practices and technologies to help achieve targeted social, economic, and environmental outcomes. Knowledge gain pertains to learned information or accepted advice; it also includes comprehending economic, social, and environmental principles, and comprehending individual and group decision-making processes. Attitudes focus on individuals' beliefs, opinions, feelings, or perspectives. Skills refer to individuals' mental and physical abilities to use new or alternative practices. And, Aspirations refer to ambitions, hopes, objectives, or desires; these are also

referred to as Behavioral Intentions in some texts. Changes in KASA can occur when people react positively to their involvement in program activities.

Level 4: Reactions

Reactions reflect participants' degree of positive or negative interest in topics addressed, their acceptance of activity leaders, and their attraction to the educational methods. Delivering relevant, research-based subject matter can help hold clientele interest. People may obtain information, education, or assistance from different agencies or organizations at the same time. Thus, the way they react to an activity sponsored by one organization may be influenced by complementary activities that are sponsored by other agencies or organizations.

Level 5: Participation

Program participants include individuals, families, groups, organizations, or communities. Participants must be sufficiently involved in program activities to acquire KASA and adopt practices needed to improve SEE conditions. Duration, continuity, frequency, and intensity of program participation all contribute to amount of KASA change.

Level 6: Activities

Activities are the various educational strategies and events used to inform, educate, or train target audiences. They range from direct personal contacts to indirect technological or mass media approaches. Program activities are determined by requirements to obtain positive reactions from participants as well as other factors needed to achieve desired changes in KASA and practices. Program activities are supported by program resources.

Level 7: Resources

Resources are time, money, and staff (including volunteers) used to plan, promote, implement, and evaluate programs. Resources also include research-based educational materials, organizational maintenance, communication technologies, and transportation.

Using the TOP Framework in Planning and Evaluation

In this model, each of the evaluation levels is matched to a planning effort that sets goals and objectives for that level. This feedback system of goal setting and goal evaluation form a logic based cause and effect model or simply a logic model. This process is designed to help educators formalize their evaluation process to provide them with important data that will assist team members in making programmatic decisions as well as financially justify programs with proven results. Each level may be operationalized from the planning and evaluation side using a series of questions that direct the process. In the following examples, levels are presented in a reverse order to reflect the relative order in which they would be evaluated, during the planning phase a top down approach of general (Level 1) to specific is encouraged:

Level 7: Resources

Planning

- What resources will you need to deliver your program: financial, facility, staff, materials, location, transportation, external expertise…?
- Identify source, availability and acquisition requirements for these resources.

Evaluation

- Record human contributions from within organization: total number of federal and contract labor hours (paid) for project; estimate hourly wage. Total number of volunteer hours; estimate volunteer hourly wage.
- Record human contributions from outside organization.
- Record monetary contributions: from organization, outside of organization.
- Record other contributions to the program.
- Record total budget.

Level 6: Activities

Planning

- What activities are you planning?
- What will participants do at activities?
- What events must occur to prepare for the actual program activities?
- When will these events and activities occur?
- What external factors will affect the success of these activities (holidays, weather, competing events, cooperation from a third party, etc.)?

Evaluation

- Categorize (by percent) education/outreach activities/events: professional development, workshops, scholarships, training, lectures, field studies, curriculum development, etc.
- Quantify events (for example, 3 workshops).
- Describe in one paragraph precisely what will occur during the program.

Level 5: Participation

Planning

- What is the target audience (be very specific)?
- What cultural, social or demographic characteristics do members of this audience share with one another?
- What is the most effective way to publicize the program in order to recruit participation?
- How many participants do you expect/desire?
- What (and how many) products will you produce?
- Who will participate in technical review capacity to represent the target audience's unique perspective?

Evaluation

- Define the specific set of individuals who actually participate in the program.
- Record the number of participants (if educator, record annual direct contact with students).
- Record the characteristics of your audience (for example, recreational boaters operating from Sandy Point marina).
- List products developed (and quantity distributed).

Level 4: Reaction

Planning

- How do project participants view your organization?
- How do participants feel about their instructors?
- How do participants feel about the project?

Evaluation

- How do participants feel about the environment after being involved in the project?
- Were participants "Satisfied" with the program?
- Did participants feel the program met their expectations/needs?
- Was the program presented in an understandable way?
- Was the instructor credible?
- Were there barriers to learning, logistics, setting, risks?

Level 3: KASA

Planning

- Does a change of behavior require new knowledge or skills that can be learned or new attitudes or awareness levels that must be developed?
- What kinds of information are required for learning?
- What are the specific learning objectives of the program?
- How will information be transmitted to program participants?
- How will you determine if participants have received, understood, or used knowledge, attitudes, skills, awareness?

Evaluation

Knowledge, Attitudes, Skills and Aspirations are unique to the program design. In the planning phase a determination must be made on the best method of "testing" comprehension of the material in a short term evaluation. Subsequent follow-up evaluations at the intermediate (3 – 6 month) or long-term (> 6 months) may be designed into the program to test for retention of short term KASA items.

- Can participants demonstrate skill presented in activity?
- Can participants recall factual information or use reference materials in an appropriate manner to find facts covered in the program?

- Is there intent to utilize the information presented in the program or activity?
- Has there been an attitude shift as the result of the information provided (requires pre and post information)?

Level 2: Behavioral Practice

Planning

- What current behavior (or lack thereof) on the part of the target audience contributes to the existing condition?
- What changes in behavior do you hope will occur as a result of the program?
- How will you know if the behavior of project participants has changed as a result of the program?
- Do you plan any follow-up activities to determine or estimate long-term changes in the behavior or the target audience?

Evaluation

- Has participation in this program changed the way you interact with the resource?
- Has participation in this program reduced the negative behavior of the target audience?
- Has participation in the program increased the positive behavior of the target audience?
- Are program participants incorporating knowledge into daily decision making?
- Are program participants acting to support sustainable policy or planning efforts?

Level 1: SEE

Planning

- What present environmental condition will the program help correct?
- Describe the situation once that condition has been corrected.
- How will you know if the condition has been corrected?
- How will your program contribute to correcting the condition?

Evaluation

- Characterize the environmental condition prior to intervention (quantify, if possible; for example, pollution index).
- Characterize the environmental condition after intervention (quantify, if possible).
- List improvements to SEE conditions that directly result from intervention
- Quantify improvements to SEE conditions that directly result from intervention (for example, % increase in recycling behavior; % increase in teachers bringing ocean conservation issues into classrooms; % increase in economic incentives to adopt ocean etiquette guidelines).

Systematic Evaluation Process: 14 Step Approach

by Martin Storksdieck, Institute for Learning Innovation

From stakeholder analysis to useful evaluation results: designing an evaluation plan for programs and activities.

For each activity, follow these steps:

1. Define how the activity fits into your overall portfolio (what program is it part of)? [Unless it is a program]
2. Define who will be the recipient/stakeholder of the evaluation. Who will need to know the results and why?
3. What do you intend to achieve with the evaluation? What purposes does it serve?
4. Define the "Big Idea" of the activity/program: what problem does it address? What service does it provide? *[Write outcome statements]*
5. Define all objectives and goals for the activity/program for each target group. Distinguish between primary, secondary and if needed, tertiary audiences.
6. Create a hierarchy of those goals for each target group. Note primary and secondary goals.
7. Sort the objectives/goals into the following categories: Reactions, Knowledge/ Awareness, Attitudes, Skills, Intentions/Aspirations, Behaviors/Activities, SES Impacts. *Note that SES Impacts are defined on the community level; all other categories are outcomes at the level of individuals.*
8. Identify and mark those Outcomes and Impacts that most represent your overall objectives for the activity/program.
9. Define indicators for these Outcomes and Impacts that indicate whether you have achieved them. Be as specific as possible.
10. Define measures for each indicator. Remember: "measures" comes from measurable. But also be aware that not every measure or indicator is quantitative in nature. Some are phenomenological. Consult with NOAA evaluation data base about measures. *[May need outside expert]*
11. Decide on methodology – how will these measures be created? *[May need outside expert]*
12. Cross-check measures with stakeholders and utilization plan: will likely results indicated by these measures fulfill your need? What needs revising? What needs to be added? If needed, go back and revise previous steps until you are reasonably assured that your evaluation will likely provide you with the information you need.
13. Implementation: Collection, Data management, Data analysis.
14. Feeding it back into the system, closing the loop to Step 2.

Evaluation Instrument Question Bank

Implementation Plan

General Goals for 2008:

- To refine existing evaluation materials and processes into an official evaluation system that supports attainment of the 2010 Education Performance Measure and Future outcome assessment goals.

- To build a supportive culture and set of administrative and planning processes that integrates education evaluation into the fabric of sanctuary operations.

- To create education evaluation plans, priorities, timelines and strategies for 25% of all NMSP Education Programs (% based on 08 Annual NMSP Education budget projections)

Education Program Managers 07-08 Timeline

January 08	Complete revisions of Program Portfolio for final submission for Program Tracking Inventory
February 08	Revise Work Plan to include allocation for Evaluation
March 08	Select and prioritize programs that you will be evaluating in 08-09
TBD May 08	Integrate program evaluation objectives into the 09 AOP process
June 08	Update Program Portfolio with budget estimates
By April 30, 08	Develop evaluation plans for programs in coordination with the Education Evaluation Coordinator
By June 1, 08	Develop evaluation instruments for selected programs
Summer 08	Pilot test Evaluation Instruments
Fall 08	Report initial findings

Note: These are proposed dates.

HQ Evaluation Support 07-08 Timeline

Winter 07	Complete pilot analysis of California B-Wet Project
February 08	Complete revisions of the Pilot Evaluation/Feedback Tool
Sp/Su 08	Conduct Pilot Test and Reliability Analysis of Feedback Tools at 3 sites
April 30, 08	Develop Web based Evaluation Toolbox and supporting database o Program Portfolio Input o Budget tracking update system o Output measure data entry system o Evaluation Instrument design tool

	o Evaluation Instrument data management system
Spring 08	Initiate discussion for OMB clearance of NMSP Outcome Evaluation tools
Spring 08	Conduct informational/training session for NMSP Executive Team and Sanctuary Managers on implementation requirements for meeting Education Performance Measures
Ongoing	Provide consultation support to NMSP Education Staff for evaluation planning and instrument design
Spring 08	Finalize Best Practices design guidelines for print products, exhibits and signage – National Outreach Coordinator
Fall 08	Compile sample report of evaluation findings and activities
Winter 08	Revise evaluation question bank
Winter 08	Distribute FINAL required and recommended evaluation questions

Note: These are proposed dates.

Beyond 2008

The following milestones have been established for completing the 2008 Education Performance Measure:

"By 2010 all education programs implemented in national marine sanctuaries will be assessed for effectiveness against stated program goals and objectives and appropriate National and State education standards."

Each percentage represents the total amount of programs evaluated based on the total budget dollars for FY2008:

- 1st Quarter FY2009 12% (% Based on total education dollars)
- 2nd Quarter FY2009 25%
- 3rd Quarter FY2009 37%
- 4th Quarter FY2009 50%
- September 2009 Analysis Report of Evaluation Performance Measure
- 1st Quarter FY2010 62%
- 2nd Quarter FY2010 75%
- 3rd Quarter FY2010 87%
- September 30, 2010 100% Evaluation of NMSP education programs
- October 2010 Analysis Report of Evaluation Performance Measure

Reference Articles

Learning to Think Evaluatively: A Simple Guide for All Free-Choice Learning Institutions

by Jill Stein, Marianna Adams, and Jessica Luke
Institute for Learning Innovation

Understanding visitors' needs is essential to building successful free-choice learning experiences. By regularly integrating the learner voice into all stages of planning, development, and implementation, we are employing "evaluative thinking", a professional practice that is vital to our success..

Simply put, thinking evaluatively means "walking a mile in the shoes" of our visitors in order to understand and respond to their needs, attitudes, perceptions, and experiences. There are many ways to bring such thinking into your daily practices. What follows is a guide to some of the basic principles, purposes and strategies for making evaluation a core part of your work

What is Evaluation?

Evaluation is a natural human process. We all observe, reflect, and note what is working or not working around us, and adjust our actions to improve what we see. When undertaken in a systematic way of thinking, evaluation becomes a more formal practice. Evaluation is <u>not</u> an "end game", a report card at the end of a process. It <u>is</u> an ongoing practice, a system for structured feedback at each step of a project. Its goal is improvement not judgment.

Evaluation should be a collaborative process -- not something done <u>to</u> people or programs. It should combine staff expertise with visitor input to design an effective experience for all.

Why Do Evaluation?

There are many important reasons to conduct evaluation: Reviewing them internally will encourage more institutional support and buy-in.

Evaluation helps define goals.

Before beginning any evaluation effort, you must define your intended goals and outcomes. Only then do you have something to "measure." Too frequently institutions skip this vital step. Common mistakes include the following:

1) Goals and objectives are simply "intuitive" rather than articulated.;
2) Goals are defined and written down without seeking consensus; or ,
3) Goals and objectives are too broad, unrealistic, and/or not measurable.

Evaluation supports museum staff in collectively articulating what would constitute the success of a project -- a challenging but extremely rewarding task. Staff become more focused, move beyond personal agendas, and concentrate on the quality of the visitor experience. As a result, the project has a much greater chance of being more effective.

Evaluation saves time and money.

Time spent thinking about and gathering data early in a project's development can save money and valuable staff time over the course of the project. Detecting problems early in the planning, allows changes to occur before an exhibition is fabricated, copies of a curriculum are printed, or a new docent training model is implemented

Evaluation leverages funding and support for projects.

Public and private funders require evaluation as part of the granting process. They, too, want evidence that their funding has meaningful impact. Clearly, all sizes of institutions need to know the basics of evaluation to compete for funds in this era of accountability.

Evaluation enhances staff communication and curiosity.

When staff are asked to think carefully about the desired outcomes of a project, they must come to consensus about those goals. The very act of working through each design issue and determining its appropriate measurement is stimulating and informative. As a result, staff often become more eager to experiment, innovate, and embrace change.

Evaluation can increase the institutions' responsiveness to the community.

To make evaluation work effectively, all staff must learn to view their work from a visitor perspective. A shift in perspective may end or moderate some long-standing or favored viewpoints to an end. There should be no sacrifice in quality, accuracy or expertise. Programs, however, will need to incorporate the visitor viewpoint. Staff are likely to feel empowered through this information to further enhance their work

Evaluation can be a stimulus towards change and growth.

Evaluation can affect change and enhance institutional growth. If an institutional environment consistently supports evaluative thinking, then projects should align themselves more closely to the institutional mission. Any disconnect between mission and action will be more glaring in light of focused and systematic evaluation. Such insight can push an institution profoundly to amplify their thinking and move beyond repetitive, defeating practices.

When Should You Do Evaluation?

The simple answer is that effective evaluation should take place at every critical stage in program or exhibit development and implementation: before, during and after. Our understanding and use of good evaluation practices, encourages institutions to ask far more varied questions than, "Did we do a good job?" Evaluation seeks to learn: "What do visitors already know about this topic?" "What more do they want to know?" "What will motivate them to attend the exhibition or program?" "What are their expectations?" "What types of personal and social learning are likely to occur?" "Do they match the goals of the program?"

Evaluation is generally divided into three main stages – 1) the planning and conceptual design phase (Front-end); 2) when the program or exhibition is up and running (Formative); and 3) near the end or after the program or exhibition is over (Summative). You need to decide what would be most helpful at each stage.

Front-End Evaluation

Front-end evaluation can be thought of as the start of a continuing conversation among museum staff, designers/advisors, visitors, and the subject matter itself. It should begin after the broad concepts and goals of a project are established but before much time or money has been invested in expanding the concepts into an actual program or exhibition. These studies are exploratory in nature and typically seek information about visitors' interests, expectations, and understanding of proposed topics.

Formative Evaluation

Formative evaluation takes place while an exhibition or program is still being planned or during the early stages of implementation. These studies are designed offer direct, concrete, and practical ways to improve a project. Research may focus on how visitors are using a program or exhibition, how they behave (e.g., social interaction, time spent, quality of engagement), what they respond best to and what they struggle with. Formative evaluation will also compare their learning outcomes with your goals and objectives. Clearly, undertaking formative evaluation requires that you be open to making changes midstream.

Summative Evaluation

Did the program do what it was intended to do? What specific aspects or components of the exhibition or program led to these outcomes? This type of study is conducted after or very near the end of an exhibition or program. Although it may be useful for making modest changes, summative evaluation is especially valuable as "lessons learned" for future projects

Who Should Do Evaluation?

Many museums interested in undertaking evaluation don't know where to begin. Their first question is often, "Should I hire an outside evaluator or try to do it myself?"

There is no simple answer to that question. An outside evaluator will bring greater objectivity to a project. Their wide range of experience is a plus; it offers broad perspectives to a critical field, including deep knowledge of current findings and practices. Professional evaluators have well-honed skills in designing studies, framing questions, selecting methods, and collecting and analyzing data. On the other hand, the process of doing evaluation as a museum practitioner provides excellent professional development opportunities for the staff and need not be an overwhelming undertaking. Combining the two – inside and outside expertise – may provide an ideal combination.

Doing it yourself

What follows are some helpful tips for conducting in-house visitor studies.

1. ***Make sure your goals are clearly defined and agreed upon.*** Work together to articulate a list of clear, agreed upon goals and objectives. Then write the questions that should give you the necessary information.

2. ***Place reasonable expectations on yourself.***
It will take time for you to develop evaluation skills. Look at this process as a long-term learning experience. Use evaluation as a way to gain greater understanding of your professional practice and to grow in your skills and knowledge.

3. ***Be realistic about the scope of your project.***
Select a small, focused question rather than a broad one; Start with a small group of visitors (20-30) to identify key trends and issues. without using up a lot of time and resources; Keep the number and focus of questions you ask visitors to a minimum. Evaluate only those issues which you have the ability to change.

4. ***Seek the support of other staff in the museum.***
Go through whatever hoops you need to for some recognition of your evaluation project. Start small, invite input, and don't get discouraged about initial resistance. After all, evaluation is sometimes seen as a negative process that will reveal what people have done wrong. You will need to educate others on the benefits of evaluation.

5. ***Embrace the process more than the product.***
Evaluation is more about informing a project than judging it. Remain open to the learning it brings as a critical way to increase buy-in and ownership among staff from all levels.

6. Be creative about the methods you use to collect data.
Evaluation is as much an art as it is a science. Be creative about your approach. Think about using existing situations as opportunities to collect data. Piggy back a question or two on other requests for visitor information.

7. Analysis and interpretation of data is the most difficult and the most satisfying step.
When you first look over the data you have collected, you may think that you have nothing more than a lot of interesting pieces of information but no pattern, no larger meaning. Look again and again - don't give up. Good information is almost always there. Finding it gets easier with experience. Remember: Take time to reflect; don't rush to conclusions. Always make analysis a team effort. Beware of using one or two anecdotes to signify a "trend." Wait until all the data has been examined before deciding what it means. Be open to seeing what you were not looking for. It may a starting point for your next try.

Working with outside evaluators

For many institutions, starting with professional evaluators will be the best decision and may even be required by funders. The most effective evaluations will bring you into partnership with your evaluation, which will enable all members of the team to grow.

If you have decided to hire an outside evaluator, there are a few points you will want to keep in mind before and during the process.

1. An Educated Consumer is the Best Customer
Even if you plan to work exclusively with an outside evaluator, your work will be far more effective it you are well informed about the nature and rationale for integrated evaluation studies.

2. Know Your Issues.
Spend time to outline the broad goals and specific outcomes of the project to be evaluated. These will be central to your first conversation with a good evaluator. See the workplan below to guide your preliminary process.

Work on these questions as a team, so that the desired outcomes are written down and agreed upon by staff before designing a project. While you will likely have many outcome goals, it is more effective to choose one to focus on for the evaluation. The next step is to form the broad evaluative question appropriate to what you want to measure. This is not an easy process, but it is essential. An outside evaluator will help you with this step but she/he will be guided by your thinking. Finally, be clear about why you want to answer that evaluation question. What do you intend to do with the information? Who will be the audience for the results?

EVALUATION ACTION PLAN WORKSHEET

Whether you decide to go with an outside evaluator or conduct some evaluation in-house, the following questions will help focus your goals and define the nature and scope of the project.

1) What are your "big" evaluation questions? What is it you want to know?

2) Why are you interested in investigating these questions? What will you do with the information?

3) List the evidence that would convince you that the evaluation questions had been answered.

4) How will you gather this evidence? What methods will you use and why?

5) From whom will you collect data? (e.g., Families? Kids? Adults? Members?)

6) When will you collect the data? (e.g., Weekdays? Weekends?)

7) How much data will you collect? (Sample size)

8) Estimated time it will take to collect all of the data:

9) Where will you collect the data?

10) What resources will you need for data collection? (e.g., tables, clipboards, pencils, gifts)

12) Who will be involved in the analysis and interpretation of the data?

13) How much time will be needed to interpret the data?

14) How will you disseminate and communicate your findings?

Based on Evaluation Training materials developed by the Institute for Learning Innovation (Annapolis, MD) and the National Museum of African Art (Washington, DC)

3. Know Your Audience.

When you contact an evaluator, you are the representative of your institution. Do your homework first. You will need to bring something to the table about your audience. You want to try to avoid paying an outside evaluator to tell you what you could have learned if you spent just a little time observing and talking to visitors. Review any existing information available to you. For example, have any surveys been done previously in your museum? What did you learn from those studies? Have studies been done by other organizations in your community on demographic trends in your area? (e.g., a government agency)

4. Good Contracts Make for Good Services.

A responsible evaluator will require that the two of you develop a written contract and a work plan/timeline for the evaluation. Either party may initiate the contract, but be sure to define expectations, as well as a means to address the unforeseen. Time spent clarity outcome goals and evaluation questions is the best safeguard for staying on track

5. Establish a Realistic Working Relationship.

Ongoing communication is key. The contact person and the evaluator will need to establish the details of when and how you will communicate. The staff representative is critical to

keeping the institutional perspective in place and to making the critical decisions that will arise. The success of the evaluation will depend in large part on the clarity of communication and the responsiveness of the museum.

6. Make an outside evaluator more affordable by collaborating with other organizations. Small museums and historic sites may find it more affordable to engage an outside evaluator by creating a "coalition" of other organizations in your area seeking similar visitor information. Pooling funds might help all partners.

Thinking Evaluatively: Engaging your whole staff

One of the greatest challenges of developing an institution that thinks evaluatively is embedding this mindset among all staff—from the front desk clerks to curators, administrators, and educators—and incorporating this way of thinking as a regular part of institutional practice and culture. Institutional change takes a long time, and many small steps along the way. Further, developing a visitor-centered organization cannot happen through the work of one or two individuals. Everyone needs to be on board. Following are some strategies and examples that can help start the process.

1. ***Have staff from all levels and departments observe visitors on the floor.*** Thinking from the visitor perspective requires spending time with them. Doing observations is a relatively quick, simple, and non-threatening way for staff and volunteers to get a better sense of how visitors use exhibits or programming. Suggest that staff members take 30 minutes at their convenience to walk around the museum and take notes on what visitors are doing and talking about. What seems to work well? What potential problems or issues do they notice? Encourage staff to write down whatever comes to mind, including thoughts, feelings, and impressions. At a follow-up meeting, have them share what they noticed, what trends they found, what was surprising, or what met their expectations. What have they learned from this activity? What more do they want to know?

2. ***Engage staff in a "visitor role-play" exercise.*** The key to thinking evaluatively is being able to "walk in the shoes" of the visitor. Ask staff to try out being a specific "visitor type," i.e., a mother with three young children; a retired couple on vacation," a couple on their first date, etc." Imagine telling or writing a friend about the experience through the perspective of their assigned visitor type. What would have been the ideal experience for this visitor? How would it contrast with the present set of offerings?

3. ***Encourage staff to bring family and friends to the museum and visit with them.*** While many staff likely bring friends and family to the museum, they usually take on an "educator" or "tour guide" role. Instead, have them practice coming to the museum or historic site as a true visitor and try to experience the museum as a visitor and not a staff person.

4. ***Involve staff in developing evaluation questions.*** Involving staff from all different levels and departments in evaluation offers a couple of key benefits: 1) they bring a variety of

perspectives; and 2) they are more likely to gain a sense of ownership and appreciation for what evaluation can offer. Facilitate a brainstorming session: What questions do they have about visitors? What have they always wanted to know about visitors but were never able to ask? What do they think are some of the biggest issues visitors face, or areas that the institution needs to improve upon in terms of the visitor experience?

5. ***Involve staff in analyzing visitor feedback.*** Have them share in reading visitor comment cards and noting trends. Have staff sort the cards into categories, look for patterns, and discuss what they learned and what that means for the institution. Often staff are surprised to find that their own perspective is not necessarily the same as that of most visitors.

6. ***Have staff make predictions about the outcomes of a study.*** If you are planning a simple evaluation study, have staff make predictions about the results and support their assertions. Then have them help collect and analyze the data and follow with a discussion of the relationship between the results and their perceptions.

Why Zoos & Aquariums Matter: Assessing the Impact of a Visit to a Zoo or Aquarium

John H. Falk, Ph.D.,
Institute for Learning Innovation
Principal Investigator

Eric M. Reinhard,
Association of Zoos & Aquariums
Principal Investigator, Report Project Manager

Cynthia L. Vernon,
Monterey Bay Aquarium
Principal Investigator

Kerry Bronnenkant,
Institute for Learning Innovation
Research Associate, Research Project Manager

Joe E. Heimlich, Ph.D.,
Institute for Learning Innovation
Senior Research Associate, Methodologist

Nora L. Deans,
Birchtree Cove Studio LLC
Report Editor

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John Falk
Eric Reinhard
Cynthia Vernon

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Executive Summary

To find out if zoos and aquariums successfully promote conservation, the Association of Zoos and Aquariums (AZA) formed strategic partnerships and undertook a three-year, nationwide study of the impacts of a visit to a zoo or aquarium. We found that going to AZA-accredited zoos and aquariums in North America does have a measurable impact on the conservation attitudes and understanding of adult visitors.

The AZA is using the study results, funded by the National Science Foundation (NSF) and developed through partnerships with the Institute of Learning Innovation (ILI) and the Monterey Bay Aquarium, to better understand and predict our member institutions' contributions to public understanding of animals and conservation. All zoos and aquariums accredited by the AZA must have a commitment to educating their visitors, and this study will help strengthen their ability to provide meaningful and effective conservation education programming.

The findings contribute insights into the overall impact of a zoo or aquarium visit — both immediately and in the months after the visit. They also provide us with an analysis of how seeing wildlife at these institutions affects the way people think about conservation and their own role in helping protect the environment.

Key results include:

• Visits to accredited zoos and aquariums prompt individuals to reconsider their role in environmental problems and conservation action, and to see themselves as part of the solution.

• Visitors believe zoos and aquariums play an important role in conservation education and animal care.

• Visitors believe they experience a stronger connection to nature as a result of their visit.

• Visitors bring with them a higher-than-expected knowledge about basic ecological concepts.

• Zoos and aquariums support and reinforce the values and attitudes of the visitor

• Visitors arrive at zoos and aquariums with specific identity-related motivations and these motivations directly impact how they conduct their visit and what meaning they derive from the experience.

Our visitor impact study shows that zoos and aquariums are enhancing public understanding of wildlife and the conservation of the places animals live. We believe these results will help institutions develop even more effective exhibitions and educational programs that help connect people with nature and encourage attitude and behavioral changes that help conservation.

The study began with a comprehensive review of existing literature about the impact of zoo and aquarium visits. The literature supported the conclusion that zoos and aquariums make a difference, but much of the earlier research had been limited in scope and in ways that did not allow the results to be applied generally across all leading zoos and aquariums.

To address this gap, we held a series of public forums with zoo and aquarium professionals. Drawing on feedback from these meetings, researchers from the Institute for Learning Innovation developed a series of studies to investigate specific factors that directly relate to visitor learning and behavior, and to analyze how this information can be used to further enhance visitors' attitudes toward wildlife and nature.

Over a three-year period, more than 5,500 visitors and twelve AZA-accredited institutions participated in the studies. We drew on various quantitative and qualitative methods, including written questionnaires, interviews, tracking studies, and Personal Meaning Mapping (PMM), which identified individual changes in visitors' thinking by allowing them to respond to a series of questions prior to and after their visit.

Fifty-four percent of the individuals surveyed offered comments about the elevated awareness of their role in conservation as a direct consequence of their visit. Forty-two percent commented on the important role that zoos and aquariums play in education.

We called a subset of the participants seven to eleven months after their visit to determine the impact of the visit over time. Sixty-one percent of visitors were able to talk about what they learned from their previous visit, and 35% reported that the visit reinforced their existing beliefs about conservation, stewardship and love of animals.

Overview of the multi-institutional research program

For the first time, we have reliable data validating the positive impact zoos and aquariums have in changing visitors' feelings and attitudes about conservation. This study clearly shows that visitors believe that accredited zoos and aquariums are deeply committed to animal care and education, and that we play an important role in species conservation. These findings enhance our goal to build America's largest wildlife conservation movement.

Jim Maddy, President and CEO, Association of Zoos and Aquariums.

Zoos and aquariums all over this country are making a difference for wildlife and wild places by sharing their passion for conservation with more than 143 million visitors a year. By creating interactive exhibits, interpretive tours and educational programs that bring people face-to-face with living animals, zoos and aquariums profoundly influence their visitors in significant ways.

But exactly how do zoos and aquariums inspire visitors to care about and care for the natural world, and take meaningful conservation action? What are the changes in conservation knowledge, understanding and attitudes of adults who visit a zoo or aquarium? How does what visitors see and do during their visits contribute to these outcomes? And how are zoos and aquariums measuring the impact?

Over the years, visitor research showed how people relate to the natural world, but gave an incomplete picture about the impact zoos and aquariums have on conservation-related knowledge, attitudes and behavior. To address this deficit of information, the AZA Conservation Education Committee assembled a national advisory group to launch a research program involving multiple AZA institutions. Initially called the Multi-Institutional Research Project (MIRP), the acronym is now used as an umbrella term to encompass studies being conducted by many institutions on various aspects of zoo and aquarium visitor impact.

MIRP's initial study summarized what is already known about the impact of a zoo or aquarium visit in a thorough literature search, Visitor Learning in Zoos and Aquariums: A Literature Review (Dierking et al, 2002).

The literature review revealed that, although zoos and aquariums promote the importance of inspiring conservation action, we have done little to assess our impact in this area. While there is some evidence of zoo experiences resulting in changes in visitors' intention to act, there are few studies demonstrating actual changes in behavior.

The more we learned, the more we realized how much we didn't know. It became abundantly clear that we faced a knowledge gap.

• How do aquariums and zoos contribute to people's **understanding and perceptions** of animals and their conservation?

• How do aquariums and zoos contribute to people's **personal and emotional connections** to animals and their conservation?

• How do zoos and aquariums contribute to the **ways people act and behave** toward animals?

• How do we **increase** these impacts?

• What do we do that is successful?

• **Who** are our visitors?

After holding public forums with zoo and aquarium professionals across the country to discuss these questions, and delving further into social research about how people learn, we concluded that knowledge, affect and behavior are inextricably linked.

That led AZA, together with the Institute for Learning Innovation (ILI), a non-profit leader in research on learning in free-choice learning settings, and the Monterey Bay Aquarium, to undertake a major research initiative and seek funding from the National Science Foundation (NSF). The research was designed to assess the impact of a zoo and aquarium visit on adults, as well as develop a set of tools that every institution could use for assessing their conservation impact on visitors.

Twelve AZA-accredited institutions and over 5,500 visitors participated in the studies over a three-year period. Institutions varied in size and geographic location to ensure a representative sample, and included:

• Arizona-Sonora Desert Museum in Tucson, Arizona
• Binder Park Zoo in Battle Creek, Michigan
• Brandywine Zoo in Wilmington, Delaware
• Bronx Zoo in Bronx, New York
• The Florida Aquarium in Tampa, Florida
• Monterey Bay Aquarium in Monterey, California
• National Aquarium in Baltimore, Maryland
• New York Aquarium in Brooklyn, New York
• North Carolina Aquarium at Roanoke Island in Manteo, North Carolina
• Oregon Coast Aquarium in Newport, Oregon
• Philadelphia Zoo in Philadelphia, Pennsylvania
• Salisbury Zoo in Salisbury, Maryland

Section One: Assessing the Impact of a Visit to a Zoo or Aquarium

Visitors do not arrive at a zoo or aquarium *tabula rasa*; they arrive with prior knowledge, experience, interest and motivations for their visit, what John Falk and Lynn Dierking (2000)

refer to as the "Personal Context." Recent research investigations confirm the important influence these factors have on visitor learning. Unlike demographic variables, Personal Context variables have the potential to predict changes in visitor knowledge and conservation attitudes.

Testing this latter assumption represented a major part of this investigation. To understand the complexity of adult learning in zoos and aquariums, we needed to capture the essence of what motivates visitors so we could better predict what they might gain from their visit. Only then might we develop an understanding of how time spent at a zoo or aquarium impacts visitors.

Our study set out to make a fundamental contribution towards a nationally shared comprehension of the role and impact of zoos and aquariums in facilitating enhanced public understanding of animals and their conservation. To achieve that, we sought to answer the following research questions:

> 1. How can we best capture the pre-existing conservation knowledge, attitudes/affect, behaviors and visit motivations of entering zoo and aquarium visitors, and how do these entering characteristics contribute to changes in public understanding of animals and their conservation?
>
> 2. What development, elaboration and/or extension of a visitor's knowledge of and attitudes towards animals and their conservation result from a zoo or aquarium visit?

To create a generalizable model and measure of zoo and aquarium cognitive and affective learning, we set up the study in two phases. The first focused on understanding something about the nature of the visitors who come to zoos and aquariums; in particular their motivations for visiting. The second phase focused on measuring changes in visitor's short and long-term conservation-related knowledge and attitudes. We believe that these two studies represent seminal research that will have long-lasting and large-scale benefits for the zoo and aquarium community as well as for the broader free-choice learning community.

Phase I Methodogy

We've learned that visitor demographics by themselves are not that helpful in telling us what knowledge and attitudes visitors bring with them during a visit, and how they might change afterwards. Previous free-choice learning research by Falk and Storksdieck (2005) found that the motivations individuals have for visiting free-choice learning institutions appear to be identity-related. Although, in theory, visitors to such institutions could possess an infinite number of identity-related visit motivations, the motivations of the vast majority of visitors appeared to cluster around just a few identity-related reasons. Based upon these findings, Falk (2006) proposed clustering these identity-related motivations into five distinct categories:

> "**Explorers**" are curiosity-driven and seek to learn more about whatever they might encounter at the institution;
>
> "**Facilitators**" are focused primarily on enabling the experience and learning of others in their accompanying social group;

"**Professional/Hobbyists**" feel a close tie between the institution's content and their professional or hobbyist passions;

"**Experience Seekers**" primarily derive satisfaction from the fact of visiting this important site; and

"**Spiritual Pilgrims**" are primarily seeking a contemplative and/or restorative experience.

Falk further postulated that these identity-related motivations were multi-dimensional and effectively encapsulated many previously identified important entering-visitor variables such as prior knowledge, prior interest, visitor agenda, social group and prior experience. In Phase I of this investigation we set out to test this hypothesis within the context of zoos and aquariums. To do this, we designed an instrument to measure zoo and aquarium visitors' identity-related motivations. We began by generating 125 items representing the five different identity-related motivational factors. We tested these items and formats at four zoos and four aquariums using traditional methods and statistical techniques of instrument development. At the end of Phase I, we identified several items for clarification and retesting.

The final product from Phase I yielded a simple-to-use, refined instrument that we believe validly and reliably measures why people come to zoos and aquariums. In addition to forming a key measure in our Phase II study, we believe these measures can be used as a robust way to capture this important independent variable in a wide variety of future research. (The complete methodological approach is included in Appendix One.)

Phase II Methodology

We collected data in Phase II of the study to answer a range of research questions related to conservation learning resulting from a general adult visitor's experiences at a zoo or aquarium. The four sites utilized in the study – two zoos and two aquariums – represented the broader zoo and aquarium community. We wanted to capture the most generalizable picture possible of the conservation knowledge of zoo and aquarium visitors as they enter and as they exit, as well as the responses, purposes, and general outcomes of their visit.

A random sample of 1,862 adults across all four sites completed pre- and post-visit instruments. The research instruments used in the study were designed to measure visitors' identity-related visit motivations as well as a range of conservation-related cognitive and affective variables identified as key to the study. In addition, two other data sets were collected; a series of one-on-one interviews to determine where in the zoo or aquarium visitors went and why (n=356) and long-term follow-up data (n=83) conducted through either telephone interviews or an email on-line survey.

Identity-Related Visit Motivation

The psychometric instrument constructed in Phase I became the identity-related visit motivation instrument in Phase II. It listed 20 statements representing four examples from each of the five key identity-related motivations common to zoo and aquarium visitors. Visitors selected the five statements that best explained why they chose to visit the zoo or aquarium on that particular day;

and then ranked each of the selected five statements in importance on a seven-point Likert-type scale.

Cognitive Measure Development
Collaborating with senior professionals from the zoo and aquarium community, we developed 10 broad-knowledge messages and 10 outcome messages that professionals believed their zoo or aquarium strives to communicate to the public. Synthesizing these responses into three constructs of biodiversity, habitat, and ecosystems, we then developed test items and pilot-tested them. The final instrument consisted of 10 multiple-choice questions.

Affective Response Measure
We determined the affective response to the visit by asking visitors to respond to a series of 13 items on an exit survey; each of the exit-only questions required visitors to indicate, on a seven-point Likert-type scale, their level of agreement with statements that related to their attitudes towards 1) conservation; 2) their ability to effect change; and 3) the role played by zoos and aquariums in promoting conservation. We also asked visitors to reflect on how they perceived they would have answered the same items before their visit to the zoo or aquarium (retrospective-pre). This type of post-only, retrospective-pre measure has been shown to be more reliable than traditional pre/post measures for assessing attitudes (Rockwell & Kohn, 1989; Stevens & Lodl, 1999).

Personal Meaning Mapping
To better understand visitors' prior knowledge of and interest in zoos and aquariums as well as to understand the individual's perception of the relationship between zoos and aquariums and conservation, we used a methodology called Personal Meaning Mapping (PPM) (Falk, Moussouri & Coulson, 1998). Approximately 20 visitors at each of the four sites (n=86) participated in a paired PMM interview. Just prior to entering the zoo or aquarium, we asked visitors to share their thoughts about a specific prompt: the words "Zoo – Conservation" or "Aquarium – Conservation." Upon exiting the zoo or aquarium, these visitors were asked to add to, subtract from, or otherwise modify any thoughts they had shared previously on the subject. Subsequent to the visitor writing down his/her responses, an investigator interviewed them in depth, utilizing the words they wrote down as prompts.

Reflective Tracking Study
We wanted to see if visitors' entering identity-related motivations affected the ways they behaved during their visit. We could not conduct a true tracking study as part of this investigation because of both the extensive visit times and large numbers of the subjects. Instead, we created a reflective tracking approach that built upon the free-choice nature of the zoo and aquarium visits. A random sample of visitors was intercepted by researchers as they entered the zoo or aquarium and invited to participate in this part of the investigation. Comparable to our standard protocol, one adult within each social group who agreed to participate completed the pre-visit instruments (knowledge and motivations). Upon leaving the zoo or aquarium, the visitors identified themselves to the researcher and were given a map of the zoo or aquarium. Individuals then described where they went and what they did. We followed

up visitor responses by asking additional questions designed to help us understand what motivated them to make the visit decisions they made.

Long-Term Impact Study
We asked all individuals who completed pre/post measures if they would be willing to provide phone and/or e-mail contact information so that they could be re-contacted later, as part of a follow-up study. We conducted the long-term impact study through both telephone and e-mail interviews of a random sample of individuals providing contact information (n=83). We also designed parallel instruments for use either by telephone or e-mail consisting of a series of open-ended questions. The questions were designed to assess visitors' recall of the particular visit seven to eleven months subsequent to the visit. Visitors were asked to recall: salient events if any from the day; motivations for the visit; if those motivations changed for any reason during the visit; and how they perceived the visit affected their knowledge and attitudes.

Results and Findings
Our three-year visitor impact study found that a visit to an accredited zoo or aquarium in North America has a measurable impact on the conservation attitudes and understanding of adult visitors. Overall, we found that:

> Visitors arrive at zoos and aquariums with specific identity-related motivations and these motivations directly impact how they conduct their visit and what meaning they make from the experience.
>
> Overall, visitors enter with a higher level of knowledge about basic ecological concepts than was expected. A small percentage of visitors (approximately 10%) did show significant positive changes in their conservation-related knowledge. However because of the higher than expected entering knowledge of most visitors, there were no statistically significant changes in overall knowledge.
>
> Most visitors (61%) found that their zoo and aquarium experience supported and reinforced their values and attitudes towards conservation.
>
> Visits to accredited zoos and aquariums prompted many individuals (54%) to reconsider their role in environmental problems and conservation action, and to see themselves as part of the solution.
>
> Roughly half (42%) of all visitors believed that zoos and aquariums play an important role in conservation education and animal care.
>
> A majority (57%) of visitors said that their visit experience strengthened their connection to nature.

Identity-Related Motivations
We had hypothesized that it should be possible to segment visitors as a function of their identity-related entering motivations. The results suggest that it was indeed possible to segment visitors using this framework. Half of visitors (48%) began their zoo or aquarium visit with a single,

dominant identity-related motivation; the rest possessed multiple motivations for visiting. Explorers and Facilitators were the two most common dominant motivations, each representing about 16% of visitors. However, all five of the major identity-related motivations were well represented in the sample.

A different profile of motivations was found at each of the four institutions with the two zoos having fairly similar profiles. The profile of the two aquariums differed, but these differences may have been due to the fact that data were collected in different seasons rather than representing a real difference in the profiles of aquarium visitors. Unfortunately, we cannot know from this study.

The study strongly supported the hypothesis that visitor's identity-related motivations subsumed a variety of entering Personal Context variables. Individuals with differing degrees of prior knowledge, interest, beliefs and attitudes tended to cluster into different identity-related motivational groups.

An interesting result of the study was that grouping visitors by identity-related motivations did appear to provide significant insights into in-institution behaviors and both short and long-term post-visit outcomes. In fact, segmenting visitors by identity-related motivations (Explorers, Facilitators, et al) provided the best way to understand both what visitors did in the institution as well as the short and long-term meaning they made from the experience. This finding has important ramifications for both future research and educational practice.

Gains in Knowledge
Overall, zoo and aquarium visitors have a broad range of knowledge and know more about major ecological concepts before they visit than we thought; consequently there was no overall statistically significant change in understanding seen. However, a few visitors (in particular Experience Seekers) showed significant changes in the conceptual understanding we chose to measure over the course of their visit ($F = 1.906$, $p = .026$). This is not to say that the other visitors do not learn from their visit. For example, we knew from previous studies that after a visit, people who visit a zoo or aquarium often know more about specific animals or exhibits. Because we were striving in this study for changes in visitors' general conservation knowledge, we did not measure the specific knowledge that visitors might have acquired from an individual zoo or aquarium. If we had sought to measure this kind of knowledge, we very likely would have found significant visitor gains.

Changes in Attitudes
We were not surprised to find that visitors are predisposed towards animals and have a strong, positive orientation towards zoos and aquariums. We were pleased to discover that their zoo and aquarium visits supported and reinforced these values and attitudes ($t = 320.834$, $p<.001$). Importantly, the data showed that most visitors leave the zoo or aquarium thinking differently about their role in environmental problems. A major finding was that individual action messages, such as "There is a lot I can to do conserve," and "I am part of the solution to nature's problems," significantly increased as a consequence of the visit (61% and 54% increases, respectively).

We also found that the vast majority of visitors perceived aquariums and zoos as places that care about animals (42% increase), and that play an important role in conservation (64% increase). Facilitators (F=13.097, p=.000), Professional/Hobbyists (F=3.898, p=.009) and Experience Seekers (F = 1.908, p = .026) were the visitor groups most likely to show significant positive change in their attitudes towards conservation and the role of zoos and aquariums.

Data from the Personal Meaning Mapping exercise strongly reinforced the affective findings described above. Nearly half (46%) of the individuals interviewed with this method offered unprompted comments related to personal actions they planned on taking as a consequence of their visit. More than a third of visitors (39%) volunteered comments related to the important educational role zoos and aquariums play in supporting conservation. Also, about half of visitors (41%) made comments related to the role of zoos and aquariums in preserving and protecting animals.

Long-term Learning and Attitudes

We know that a visit to a zoo or aquarium does result in changes in visitor learning, attitudes and behaviors. Yet, these changes can only be partially understood by collecting data immediately after the experience, while the visitor is still at the zoo or aquarium.

A much more complete picture comes to light weeks and months later, after individuals have had a chance to make sense of their experience, integrate their learning into their lives, and act upon any new interests or motivations inspired by their visit (see review by Anderson, Storksdieck & Spock, 2007).

Nearly a year after their zoo or aquarium visit, virtually all participants could talk about their visit and remember a number of details about the experience. Roughly half (42%) of all visitors we interviewed mentioned a particular animal or species as the highlight of their visit, while for one in five visitors (21%), the physical layout and aesthetics of the surroundings were important and memorable. Importantly, given our earlier findings related to changes in knowledge, over half of visitors (61%) talked to us about what they learned (either reinforced prior understandings or new knowledge gained) from their zoo or aquarium visit.

When asked what the zoo or aquarium hoped visitors would take away from their visit, 40% of visitors mentioned conservation-oriented themes. A large majority of visitors (76%) indicated that they believed that zoos and aquariums are invested in conservation and education. Once again reinforcing our earlier findings, a large number of visitors (66%) said that zoos and aquariums play an important role in species preservation and in increasing their visitors' awareness of conservation issues.

Section Two: Implications for Zoos and Aquariums

Zoos and aquariums do make a difference in the conservation knowledge and attitudes of visitors. How do we build on that knowledge to enhance zoo and aquarium conservation goals and connect those goals to the visitor experience? We have thoroughly reviewed the research findings and compiled the following take-home messages and recommendations for improving institutional practice:

What do visitors learn?
Finding: Visitors already know a lot about basic biological concepts.
Implication: Zoos and aquariums should spend more time on specific conservation and natural history messages. Most visitors are ready to be more engaged in advocacy efforts.

How do visitors feel about conservation?
Finding: A visit increases visitors' feelings that they are part of conservation. They leave with a stronger idea of their role in environmental problems: "I'm the solution." The largest gains in the questionnaire items related to individual action: "There's a lot I can do for conservation."
Implications: We should continue to emphasize conservation action in educational programming and exhibitions at our zoos and aquariums. Visitors want to be involved in conservation and look to us to find out how.

Finding: We convey that we care about animals.
Implication: We should continue to explain our animal welfare standards and demonstrate how we care for animals in our care and in the wild.

Finding: Visitors may see their visit as a nature experience; we can successfully encourage them to explore and value nature.
Implication: Other research has shown that spending time in nature is critical for the development of an environmental ethic and in promoting healthy children. For urban dwellers, we may be their best "nature experience" – a strong marketing point.

Why do visitors visit?
Finding: Most visitors come for multiple reasons, but the majority of visitors have a single dominant identity-related motivation.
Implications: Aquariums and zoos should offer multiple layers of experiences to appeal to the broad array of visitor motivations, goals, and learning outcomes. They should design experiences for each dominant group in order to better match their desired outcomes:

> ***Facilitators***
> *Finding*: Facilitators are one of the two major groups with a dominant motivation.
> *Implications*: First and foremost, Facilitators desire a social experience aimed at the satisfaction of someone else. Zoos and aquariums need to offer them opportunities for social interaction at exhibits and during programs, such as opportunities to talk with staff, and to provide places for regrouping and processing of their visit. Zoos and aquariums

also need to ensure that parents, in particular, have the tools to support their children's learning.

Explorers
Finding: Explorers, who visit for personal interests, are also one of the two major groups with a dominant motivation. Explorers were one of the two groups who showed neither significant changes in cognition or affect.
Implications: An Explorer's visit satisfaction is tied to the quality of the learning experience, including the ability to see animals and the interpretation. Ironically, zoos and aquariums often tend to design for this group because they are so much like zoo and aquarium professionals, but the data suggests institutions are not necessarily being successful with this approach. Zoos and aquariums need to provide Explorers with new or surprising offerings, such as temporary exhibits or in-depth programs and create more challenging experiences than currently seem to exist in some zoos and aquariums.

Experience Seekers
Finding: Experience Seekers visit as tourists or they value the zoo or aquarium as part of the community.
Implications: A unique program or offering that surpasses other local attractions will draw these kinds of visitors. Experience Seekers possess the least knowledge and the lowest expectations for their visit; they also represented a small number of visitors in our sample (7.8%). However, this was the one group that showed significant positive change in both cognition and affect.

Professional/Hobbyist
Finding: A small (roughly 10%) but important group for zoos and aquariums, Professional/Hobbyists are tuned into institutional goals and activities.
Implications: Professional/Hobbyists are likely interested in premium programs, for example, photo tours, dive trips, how-to workshops, and theme nights. They are also a great source of volunteers, members and donors.

Spiritual Pilgrim
Finding: Spiritual Pilgrims are the smallest group overall (4%), with very different needs, and tend to be more common in aquariums.
Implications: Aquariums and zoos need to balance the needs of Spiritual Pilgrims with those of other visitors (e.g., the very social Facilitators). Zoos and aquariums could create areas for reflection, and offer programs at quieter times of day or year. Like Professional/Hobbyists, Spiritual Pilgrims represent a great source of volunteers, members and donors.

Identity-Related Motivations

Identity	Motivation	Typical Statement
Experience Seeker	Visiting because this is considered an important local site or attraction	"I've been told that this is one of the best places to visit around here."
Professional/Hobbyist	Visiting in order to fulfill professional or hobby-related interests	"We're both SCUBA divers and this helps us learn our fish."
Spiritual Pilgrim	Visit is for "re-creation"; to provide relief from normal routine	"I feel at peace in these surroundings."
Facilitator	Visiting in order to satisfy someone else's needs, e.g., children or significant adult.	"My children really enjoy seeing the animals and it makes them happy."
Explorer	Visit is designed to satisfy individual's own personal interests	"I love penguins."

Section Three: Visitor Impact Toolbox

One of the major goals in this study was to produce a series of evaluation tools that would assist zoos and aquariums in better understanding their visitors; why they come, what they do and what they take away from the experience. The following toolbox items, some of which are direct products of this study, will be available for all AZA-accredited zoos and aquariums.

Conservation Affective Instrument
A major goal of all AZA-accredited zoos and aquariums is communicating the importance of conservation, the role that individuals can play in supporting conservation and the vital role that zoos and aquariums are playing in promoting and supporting conservation. In direct consultation with the AZA Conservation Education Committee and with input from this project's national advisors and participants at the AZA's schools for professional development, the Institute for Learning Innovation developed an affective assessment tool that validly and reliably measures changes in visitors' attitudes towards these key conservation topics.

The toolbox provides a guide to implementing and utilizing this instrument within any institution. It helps aquariums and zoos measure their effectiveness in supporting visitor conservation attitude change; it also enables institutions to contribute to the development of a national AZA database, which helps all AZA-accredited zoos and aquariums better substantiate the contribution they are making to public conservation education.

Identity–Related Motivational Categories of Visitors
We know that many different types of people come to zoos and aquariums. We also know that people visit for multiple reasons. These differences influence how individuals use these institutions and what benefits they derive. Historically, zoos and aquariums have used demographic categories like age, social group, race/ethnicity, level of education and visit frequency/infrequency as a means for segmenting audiences. Recent research, including research conducted as part of this study, is revealing powerful new and more robust ways to understand and segment zoo and aquarium visitors.

This new strategy utilizes a series of identity-related motivations for distinguishing among visitors. Every visitor enters with a set of expectations that can be categorized as falling within one or some combination of five major identity-based categories: Experience Seeker, Professional/ Hobbyist, Spiritual Pilgrim, Facilitator, or Explorer. Research shows that individuals not only choose to visit or not visit zoos and aquariums based upon these identity-based motivations, but it also shows that these motivations largely determine how visitors conduct their visit and strongly influences long-term learning and sense of satisfaction with a visit.

The toolbox includes tips on how to identify and think about these five identity-based motivational categories, as well as suggestions on how to use them to facilitate and improve interpretation, marketing, evaluation and even fund-raising.

Personal Meaning Mapping
Personal Meaning Mapping (PMM) is based upon current cognitive and neural science research that shows learning is a relative and constructive process. PMM is designed to quantifiably measure how an educational experience uniquely affects each individual's conceptual and attitudinal understanding. PMM takes into account each visitor's unique, personal construction of knowledge and experience. PMM also facilitates the identification of individual visitor's prior knowledge, concepts, attitudes and vocabulary (baseline) about a particular subject, such as zoos, aquariums and conservation, and provides a mechanism for meaningfully assessing how these change as a function of a zoo/aquarium experience. By comparing the relative and unique impact of a single educational experience across many different people, PMM allows for an overall assessment of the impact of that experience on the public.

The toolbox includes a guide to literature about PMM as well as a "how to" manual for implementation and analysis of Personal Meaning Mapping.

Reflective Tracking Study
Tracking, a tried-and-true technique for understanding visitor behavior and learning, involves following visitors throughout the course of their visit to know where they went and what they did. However, true visitor tracking for a zoo or aquarium visit can be enormously challenging and costly because of both the extensive visit times and large number of subjects. We certainly encountered that in this study, a reality that was compounded by the large numbers of the subjects with which we were dealing. To get around this problem and deal with the unique realities of zoos and aquariums, we created a new technique we call "reflective tracking."

We approached visitors as they entered the zoo or aquarium and asked if they would be willing to participate in an in-depth inquiry into their visit. In exchange, we offered them the opportunity to discover "how many steps they will take today" using a pedometer. Amazingly, as we found with similar interventions, virtually everyone sought us out at the end of their visit, returned their pedometers and consented to being interviewed about their visit. Using a map of the facility, individuals or families were encouraged to show where they walked and where they stopped. The visitors could either mark their journey through the facility on the map or use the map to point where they had gone and have the researcher place the mark on the map. We used open-ended questioning to illicit information on who made the suggestions/decisions on where to go within the group and how the group determined time allocation within and across the visit.

The toolbox includes a "how to" manual for conducting and adapting this reflective tracking instrument for use in any zoo or aquarium.

Appendix One: Study Methodology

Phase I
Phase I of this two-part research study aimed to create a meaningful categorization of visitors based on their knowledge, interests, beliefs, attitudes, behaviors, and motivations; characteristics that directly affect the core educational outcomes of a zoo and aquarium visit. Phase I research was built upon previous investigations by the Institute for Learning Innovation researchers that suggested that many of these multiple "entry" variables could be successfully subsumed into a single, multi-dimensional variable related to visitor's identity-related motivations.

Hence, Phase I research began with a confirmatory study to verify the validity, within a zoo and aquarium context, of using an identity-related motivational classification developed as part of a multi-year research investigation of visitors to science centers. The pilot research was complemented by an extensive literature review. These two investigations – the confirmatory study and the literature review – reinforced the validity of this approach and provided the necessary insights to move toward the creation of a research tool for measuring the identity-based motivations of zoo and aquarium visitors.

The five identity-related motivations are:

- Experience Seeker
- Professional/Hobbyist
- Spiritual Pilgrim
- Facilitator
- Explorer

Designing a single measure for validly and reliably capturing zoo and aquarium visitors' identity-related motivations required an intensive instrument development process. The full

report details the process, and includes the statistical analysis and modifications. The remainder of this summary outlines the steps used in the process.

First, using language derived from interviews in the confirmatory study, an "item bank" was generated by selecting statements that clearly related to each of the five unique zoo and aquarium visitor identity-related motivations. According to Falk (2006), Explorers visit to satisfy their own curiosity and desire to learn. By contrast, the Facilitator is someone who is visiting to satisfy the needs of others. The Professional/Hobbyist visits because of a specific interest, knowledge or training in an area related to the zoo or aquarium and is looking to specifically extend that interest, knowledge and or training. The Experience Seeker is someone who is visiting, often from out-of-town, who wants to have the experience of visiting a zoo or aquarium; often because this is what someone from out-of-town does when visiting this city. Finally, the Spiritual Pilgrim goes to the zoo or aquarium for reflective purposes; to get away from the noise and hubbub of the city or to enjoy the peacefulness of the setting.

Construct validation was assured by asking a panel of experts from the AZA-NSF Advisory Board[1] to confirm that the factors and items were complete. The items were placed into five scales, one for each factor. A differential scale comparing descriptions of each of the factors in a paired comparison (rotation) was also developed and tested for usability and reliability. This differential scale was constructed to serve as a constant to determine weight response patterns on the items, or as a dependent variable for analysis.

At the first four sites (Sonoran Desert Museum, Monterey Bay Aquarium, Aquarium of the Pacific, and Binder Park Zoo), a total of 1,585 individuals completed the differential scale and one of the factor scales. After a series of statistical analysis, a weighted (dampened) scoring system was used to select the strongest indicator items for each of the scales. The three dominant weighted items and the three most negative (indicating selectivity) were identified and, with some modifications, selected as the items for the second round of instrument testing. Twenty-five items were selected and two different formats (Likert-type and equal appearing) were created. On the Likert-type scale, items were clustered by factor then randomly placed. For the equal appearing scale, factors and items were randomly ordered.

After gathering data at sites five and six (Bronx Zoo and North Carolina Aquarium-Roanoke Island; N=800), scales were analyzed using a series of statistical processes; principal component factor analysis proved to be the most descriptive. For the Likert-type scale, the three dominant loading items were selected—and in some cases modified—to create a scale with 15 items that represented the five unique zoo and aquarium visitor's identity- related motivations. In order to maximize score range, only one item from each motivational category was removed from the equal appearing scale. Due to analysis differences between the scales, the items selected for each scale were not necessarily the same.

The final two sites (The Florida Aquarium and Brandywine Zoo; N=654) were used to compare the scales. At these sites, the differential scale was eliminated because it caused frustration

[1] Project National Advisory Board: Cheryl Asa , Nancy Falasco, Jeff Hayward, Rachel Kaplan, Eugene Matusov, Bill Mott, Jackie Ogden, Scott Paris, Eric Reinhard, Carol Saunders, and Kathy Wagner.

among some participants who did not understand how to complete it. The two scales—the Likert-type and equal appearing—were then completed by all respondents, providing a strong base for correlational analysis.

The process to design an instrument to measure zoo and aquarium visitor's identity- related motivations began with the confirmatory study and literature review, which informed the creation of items. More than 100 items representing the five different motivational factors were generated initially. These items and formats were tested using traditional methods and statistical techniques of instrument development. At the end of Phase I, several items had been identified for clarification and retesting. The final product from Phase I was a simple-to-use refined instrument that validly and reliably measures why people come to zoos and aquariums and can be used as a robust independent variable in a wide variety of future research, in particular in Phase II of Assessing the Impact of a Visit to a Zoo or Aquarium.

Study Methodology: Phase II

Data was collected during the Phase II study in order to answer the study's research questions related to the conservation learning resulting from a general adult visitor's experiences at a zoo or aquarium.

The questions guiding this component of the study were:

> What conservation messages do zoos and aquariums consistently strive to communicate to the public?
>
> What is visitors' entering knowledge of these conservation messages?
>
> What is visitors' exiting knowledge of these conservation messages?
>
> How does exiting knowledge relate to visitors' entering conditions such as their identity-related motivations for the visit?
>
> What are visitors' affective outcomes from a visit to zoo or aquarium and how do these outcomes relate to changes in visitor knowledge?
>
> Does a zoo or aquarium visit change an individual's ability to discuss conservation and the role of zoos or aquariums in supporting conservation?
>
> What are some of the longer-term impacts of a visit to a zoo or aquarium and are these impacts influenced by the individual's pre-visit identity-related visit motivations?

The four sites utilized in this part of the study–Philadelphia Zoo, Salisbury Zoo, New York Aquarium and National Aquarium in Baltimore—were selected to be as broadly representative of the zoo and aquarium community as was possible within the financially- imposed constraint of

selecting only institutions in the Mid-Atlantic area. Our goal was to have a mix of institutions that would enable us have as generalizable a picture as possible of the entering and exiting conservation knowledge of typical adult zoo and aquarium visitors as well as the responses, purposes, and general outcomes of a visit to a typical zoo or aquarium.

Cognitive Measure Development
A multi-step process involving a representative sampling of zoo and aquarium professionals was utilized to identify the "common messages" that most zoos and aquariums strive to communicate to the public. The first step involved asking a nationally prominent group of twelve zoo and aquarium educators and researchers during a half-day workshop to generate as complete a list as possible of the cognitive messages they believed were communicated by zoos and aquariums nationally.

In addition to knowledge-related messages, the group also identified several affective outcome messages (perceptual knowledge, awareness). This list was then discussed and clarified to reduce duplications and to insure broad consensus. The resulting messages were then organized and refined and submitted to a second national group of zoo and aquarium educators who engaged in a process of reviewing all the messages, adding or removing messages, and then voting on the ten knowledge messages that their own zoo/aquarium strives to communicate to the public and the ten affective messages that their own zoo/aquarium desires as an outcome of a visit.

The top items were explored for themes and four clear categories of conservation knowledge messages emerged: biodiversity; endangered species; habitat; and ecosystem. From the various statements written by zoo and aquarium educators, test items were developed in each of the four categories. A third panel of experts including both ecologists and educators, reviewed the test items for validity and identified those that were the best "indicators" within each category.

These test items were then constructed into multiple-choice questions. Detractors were developed for each item using the standard that all choices should look probable to the uninformed; two should look equally probable to the somewhat informed; only one is clearly correct. The resulting set of questions was tested first at the National Aquarium in Baltimore (n=65) and item analysis were run. The questions were revised and again tested at the Columbus Zoo and Aquarium (n=90) and item analysis again run. A final revision and reliability test at the Columbus Zoo and Aquarium (n=75) provided the distribution of response consistency expected between tests and suggested that eight of the ten items had the intended distribution for classical test analysis. For nine of the ten items, the correct answer received the plurality or majority (on two items) of responses and had the lowest deviation. On all items, two of the detractor items were closely aligned statistically.

Overall, analysis showed that for all questions the correct response was identified clearly by those who knew the correct response, the two "middle items" were equally confusing to those who did not know the correct response but were making an educated guess, and there was one item for each question which respondents would pick if they were purely "guessing." For the final instrument, the sequence of detractors was randomly assigned for each question and several forms of the instrument were created to randomly order test questions. For the post, the order of

items was again randomly altered. The final instrument was made up of ten, multiple-choice questions.

Identity-Related Visit Motivation
Previous research (cf., Falk & Storksdieck, 2006) has shown that a visitor's entering conditions, for example prior knowledge, interest, motivation and social group, strongly influence the zoo and aquarium visit experience. Subsequent research, including research conducted during Phase I of this project (Falk, 2006; Heimlich, et al., 2004) demonstrated that a single, composite variable defined as a visitor's identity-related visit motivations could be used to subsume many of these categories. As described in detail in Phase I reports (cf., Heimlich, et al., 2004) and above, investigators developed, through a psychometric procedure, an instrument that reliably and validly measured visitors' identity-related motivations. The instrument listed 20 statements. Visitors selected the five statements that best explained why they chose to visit the zoo or aquarium on that particular day. Then each of the five statements was selected, and ranked in order of importance on a seven-point Likert-type scale.

Affective Response Measure
Affective change was captured by asking visitors to respond to an exit survey. The exit-only affective instrument was comprised of 13 items, each of which required visitors to indicate on a 7-point Likert-type scale their level of agreement with the statements that related to their attitudes towards conservation and the role played by zoos and aquariums in promoting conservation. Visitors were also asked to reflect on how they believed they would have answered before their visit to the zoo or aquarium. The use of a post with retrospective pre-measure, as opposed to a more common pre- and post-test, was selected for this study because studies (see for example: Rockwell & Kohn, 1989; Stevens & Lodl, 1999) have shown that this approach yields greater reliability. Traditional pre/post measures suffer from ceiling effects because individuals tend to over-report their attitudes on the pre-measure. The scale used in this study had reliability co-efficient of .842. A confirmatory factor analysis revealed all items loading onto one component and explained 41.5% of the variance.

Personal Meaning Mapping
To better understand visitors' prior knowledge of and interest in zoos and aquariums and the relationship individuals perceived between zoos and aquariums and conservation, as well as assessing how the zoo and aquarium visit contributed to visitors' thinking about these topics, investigators used a methodology called Personal Meaning Mapping (PMM) (Adams, Falk & Dierking, 2003; Falk, Moussourri & Coulson, 1998; Falk, 2003).

PMM, developed by John Falk and his colleagues at the Institute for Learning Innovation, is based upon current cognitive and neural science research that shows learning is a relative and constructive process. PMM is designed to quantifiably measure how an educational experience uniquely affects each individual's conceptual and attitudinal understanding. The power of PMM as a methodology is three-fold:

> PMM yields reliable quantitative results from a qualitative method of data collection which takes into account unique, personal constructions of knowledge and experiences;

PMM facilitates the identification of an individual's prior knowledge, concepts, attitudes and vocabulary (baseline) about a particular subject, such as zoos, aquariums and conservation;

PMM provides a mechanism for meaningfully assessing and comparing the relative and unique impact of a single educational experience across many different people.

Approximately 20 visitors from each of the four sites participated in a paired PMM interview. Just prior to entering the zoo or aquarium, visitors were asked to share their thoughts about a specific prompt, the words "Zoo – Conservation" or "Aquarium – Conservation." Upon exiting the zoo or aquarium, these visitors were asked to add to, subtract from, or otherwise modify any thoughts they had shared previously on the subject. Paired data provided a rigorous mechanism for comparing individual change in a visitor's experiences, knowledge, and attitudes. Entry PMMs established "baseline" information, which could then be compared to visitors' understandings and attitudes after their visits. During the interviews, researchers recorded visitors' responses.

For each visitor, learning was assessed along two semi-independent learning parameters: 1) extent of knowledge and 2) depth of understanding. The first parameter focuses on an individual's vocabulary. This parameter attempts to document the extent of a visitor's awareness and understanding of the terms zoo or aquarium and conservation by looking at the vocabulary and ideas the individual used to discuss this concept. The second parameter assesses the depth of a visitor's understanding in order to capture how deeply and richly he/she understands a particular concept.

Reflective Tracking Study

There was a desire to see if visitors' entering identity-related motivations affected the ways in which they behaved during their visit. It was not possible to conduct a true tracking study as part of this investigation because of both the extensive visit times and large numbers of the subjects. Instead, a reflective tracking approach was created that built upon the free-choice nature of the zoo and aquarium visits. A random sample of visitors was intercepted by researchers as they entered the zoo or aquarium and provided an incentive to participate in the study by being offered an opportunity to borrow a pedometer and "find out how many steps you take today." One adult within each social group who agreed to participate completed the pre-visit instruments (knowledge and motivations) and one of the group members was given a pedometer to wear. Groups were instructed to find the researcher upon exiting in order to find out how many steps they took and return the pedometer. Upon exiting, the number of steps recorded by the pedometer were written down (but not analyzed as the pedometers were not of a quality to ensure consistent readings) and the individual, and often the entire group, engaged in describing their visit. Using a map of the facility, individuals or families were encouraged to show where they walked and where they stopped. The visitors could either mark their journey through the facility on the map or use the map to point where they had gone and have the researcher mark on the map. The researchers used open-ended questioning to illicit information on: 1) Who made the suggestions/decisions on where to go within the group? 2) How did the group determine time allocation within and across the visit?; and 3) To what extent were identity-related dimensions

driving decisions and what were the interest and cognitive dimensions that intersected with these identity-related decisions? A total of 356 visit interviews were conducted at the four sites.

Long-Term Impact Study
Individuals who completed pre/post measures were asked if they would provide phone and/or e-mail contact information to participate in a follow-up study. The long-term impact study was conducted through both telephone and e-mail interviews. An initial attempt was made to randomly select a representative number of individuals from each reported identity-related motivation category, but due to low response rates, solicitations were ultimately sent out to all remaining individuals for whom we had contact information (n=592). The final sample of 84 completed interviews was the result of approximately 488 contact attempts through telephone calls and e-mails. Several individuals were contacted more than once, thus a valid response rate may not be generated from this figure.

Both phone interviews and e-mail questionnaires were parallel. A series of open-ended questions were developed that focused on: 1) recall of the particular visit; 2) salient events if any from the day; 3) recall of motivations for the visit and determination if those motivations changed for any reason during the visit; and 4) self-reported knowledge and attitudinal outcomes from the visit.

Conditions of Study
One large zoo and one large aquarium and one small zoo and one small aquarium were selected by AZA for the study. Data were collected during peak summer visitation periods. Researchers were on site at each facility for 14 days during summer 2005. In addition, each institution dedicated staff and/or volunteers (trained by the researchers) who gathered additional pre/post knowledge measures; entering identity-related motivation measures; and post affect measures. The project set a goal of a minimum of 800 matched pre-post items; over 1,000 matched pre-post measures were obtained (N = 1,861). In addition, there were 250 pre and 250 post only instruments completed. To minimize bias in the sample, a "continual ask" method was employed (i.e., the first available visitor group would be intercepted, followed by the next available group, and so forth.). A refusal log was maintained.

Data Analysis
Data were entered into SPSS+ for analysis. Central tendencies were reported for all items; summated scores were used for individual scores on knowledge. Pearson product-moment correlations were used with conditions of entry (15 potential categories of entry conditions). Paired t-tests were used for the matched pre/post measures. For many of the descriptive items in this study, a Kendall's Tau b was used. To determine the differences in scales and subscales, analysis of variance (ANOVA) was used.

Correlations were determined with Spearman's Rho. Finally, COANOVA was used to explore the relationship between entering identity-related motivations and change in knowledge and affect at each site.

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Appendix Three: Study Sites

Phase I
Arizona-Sonora Desert Museum in Tucson, Arizona
Association of Zoos and Aquariums, Silver Spring, Maryland
Binder Park Zoo in Battle Creek, Michigan
Brandywine Zoo in Wilmington, Delaware
Bronx Zoo in Bronx, New York
Institute for Learning Innovation Incorporated, Annapolis, Maryland
Monterey Bay Aquarium in Monterey, California
North Carolina Aquarium at Roanoke Island in Manteo, North Carolina
Oregon Coast Aquarium in Newport, Oregon
The Florida Aquarium in Tampa, Florida

Phase II
Association of Zoos and Aquariums, Silver Spring, Maryland
Institute for Learning Innovation Incorporated, Annapolis, Maryland
Monterey Bay Aquarium in Monterey, California
National Aquarium in Baltimore, Maryland
New York Aquarium in Brooklyn, New York
Philadelphia Zoo in Philadelphia, Pennsylvania
Salisbury Zoo in Salisbury, Maryland

Project Advisory Board
Cheryl Asa, Ph.D., Saint Louis Zoo
Nancy Falasco, Brandywine Zoo
Jeff Hayward, Ph.D., People, Places & Design Research
Rachel Kaplan, Ph.D., University of Michigan
Eugene Matusov, Ph.D., University of Delaware
Bill Mott, The Ocean Project
Jackie Ogden, Ph.D., Disney's Animal Kingdom
Scott Paris, Ph.D., University of Michigan
Carol Saunders, Ph.D., Brookfield Zoo
Kathy Wagner, Philadelphia Zoo

Appendix Four: AZA Conservation Messages

All life on Earth exists within an ecosystem.

a. Ecosystems are made of interdependent relationships between groups of living things (biodiversity) and their physical environment.

b. An impact on any element of an ecosystem has ramifications throughout the ecosystem.

Human beings are an integral part of all ecosystems.

a. Human activities within ecosystems affect these systems

Healthy ecosystems provide many essential services and benefits that sustain and improve human lives.

a. Natural systems maintain a habitable planet by regulating climate and by cycling water, oxygen and carbon dioxide and soil nutrients.

b. Natural systems provide human beings with essential services (ecosystem services) that sustain life on Earth: fresh air, clean water, soil and oceans that can produce food.

c. People depend on thousands of plants and animals to live their daily lives.

d. Biological diversity provides a multitude of natural resources used commercially for food, shelter, fiber, and other products.

e. Nature is the primary source for many common medicines upon which so many of us depend, and is also the likely source for promising new pharmaceuticals that may hold the secret for combating cancers, AIDS, and other threatening diseases.

f. Healthy ecosystems underpin healthy human economics and sustainable nature systems support sustainable human communities. Many jobs depend directly on protecting natural ecosystems (fishing, farming, etc.).

The human experience requires a connection to nature. These experiences in wild places in our community enrich our lives and inspire our choices for future generations.

a. For all human beings, nature is a place to renew the human spirit and refresh our emotional and mental health. For people of faith, nature is the work of and a connection to a higher power.

b. Nature provides wondrous places to play and recreate, to explore, to be creative, to learn and enjoy both as individuals and with our friends and families.

c. The beauty and resources of the natural world are national treasures. They help define America's national heritage and character, and provide the nation with valuable and irreplaceable natural resources.

d. The variety of life on Earth, its biodiversity, is both essential and inspirational for human existence.

Human beings are responsible for dramatic changes to ecosystems at a rate unprecedented in Earth's history.

a. The growth of the human population coupled with the increased consumption of resources by individuals will increasingly impact the planet's finite resources.

b. The primary human threats to the environment are global warming, habitat destruction, invasive species, and overuse of individual species.

We have the responsibility to care for the Earth, to leave healthy ecosystems for our families and future generations.

a. Due to the unprecedented changes the human species is causing on the planet, we must often intervene to save wildlife.

b. Many decisions involved with caring for the Earth are extremely complex, and must take into account both human and animal needs.

Through informed actions, we can positively impact ecosystems. These actions include:

a. Making appropriate lifestyle decisions.

b. Actively participating in public decisions.

c. Sharing our knowledge and feelings about wildlife and wild places.

d. Supporting conservation organizations, including AZA zoos and aquariums.

e. Being "informed" means considering multiple points of view.

Responsible zoos and aquariums strive to conserve ecosystems and promote care and positive action for the natural world.

a. Responsible zoos and aquariums share knowledge, ideas and projects that empower people to take conservation action.

b. Responsible zoos and aquariums are active partners in the conservation community and help further conservation efforts worldwide by seeking workable and realistic solutions to conservation problems.

c. Responsible zoos and aquariums provide animal and nature experiences that engender a sense of wonder.

d. Responsible zoos and aquariums disseminate valuable information about animals and the ecosystems they inhabit.

e. Responsible zoos and aquariums model caring by being leaders in animal care.

f. Responsible zoos and aquariums commit to serving diverse segments of human society and provide a forum for exploring and communicating different perspectives concerning the natural world

Appendix: Program Tracking Tools

1. Program Overview Datasheet
2. Bennet Evaluation Level Tracking
3. Annual Budget Tracking Sheet
4. Program Resource Balance Sheet
5. Activity Tracking Sheet: Teacher Education Program
6. Activity Tracking Sheet: Student Education Program
7. Activity Tracking Sheet: Community Outreach Event

NMSP Education Program Overview

Sanctuary: _____

Program Title: _____

Program Manager: _____

Date Program was initiated: _____ **Overview revision date:** _____

Purpose: Please describe the general purpose and mission of the program.

_____

_____

_____

_____

_____

Themes: Please provide a detailed list of the national themes addressed by this program and general content under each.

_____

_____

_____

_____

_____

_____

_____

Desired Outcomes: Please list the outcomes you seek to address with this program. Classify by Reaction, Knowledge/Awareness, Skills, Aspirations, Behaviors and Overall Impact.

_____

_____

_____

_____

_____

_____

_____

Target Audience(s): Please describe the audience or audiences to whom this program is targeted.

Activities: Please list the types of activities related to the delivery of this program.

Evaluation: Please describe the methods used to evaluate effectiveness of this program.

Bennet TOP Evaluation Level Tracking

Program	Resource	Activity	Participant	Reaction	KASA	Behavior	SEE

NMSP Education Program Annual Budget Tracking Sheet

Sanctuary Unit:_____

Program:_____ Program Manager:_____

Fiscal Year	Requested	Allocated	Comments

NMSP Education Program Resource Balance Sheet

Budget Year:_____ Total Budget:_____ Sanctuary Unit:_____

Program:_____ Program Manager:_____

NMSP Budgetary Allocations

Item	Projected	Allocated	Expended
Federal Labor			
Contract Labor			
Training			
Travel			
Transportation			
Utilities/Rent			
Printing			
Other Contracts			
Supplies			
ADP Equipment			
Other Equipment			
Grants			
Other			
TOTALS			

Non-NMSP Budgetary Allocations

Item	Projected	Allocated	Expended
Grants			
Monetary Donations			
Admission Fees			
Volunteer Labor			
Facility Usage			
Equipment Donations			
In-kind Services			
Supplies			
Other			
TOTALS			

NMSP Program Tracking Sheet: Teacher Education Programs

Program Title: ____ Sanctuary: ______________________________

Activity: **Teacher Education Program** Administrator: ____________________________

Tracking Unit: **Teacher Participants** Multiplier: **Actual Annual Student Contacts**

Date	Audience/Event	Location	Grade	Participant Count	Contact Count
		Onsite Field Conference Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		

Date	Audience/Event	Location	Grade	Participant Count	Contact Count
		Onsite Field Conference Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		
		Onsite Field Classroom Boat Other:	Elementary Middle High		

NMSP Program Tracking Sheet: Student Education Programs

Program Title: ______________________________ Sanctuary: ______________________________

Activity: **Student Education Program** Administrator: ______________________________

Tracking Unit: **Student Participants**

Date	Audience/Event	Location	Underserved Population (if yes, describe)	Grade	Count
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	

Date	Audience/Event	Location	Underserved Population (if yes, describe)	Grade	Count
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	
		Onsite Field Classroom Boat Other:		Elementary Middle High	

NMSP Program Tracking Sheet: Community Outreach Events

Program Title: _____ Sanctuary: _____

Activity: **Community Outreach Event** Administrator: _____

Tracking Unit: **Estimate of Booth Visitation** Event Visitation: **Estimated total participants**

Date	Audience/Event/Sponsor	Location	Count Method	Booth Visits	Event Visitation

Date	Audience/Event/Sponsor	Location	Count Method	Booth Visits	Event Visitation

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The Ocean Literacy Network
http://www.coexploration.org/oceanliteracy/

The Ocean Project